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## 1.—PLATYHELMINTH AND ACANTHOCEPHALAN PARASITES OF LOCAL SHAGS.

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### INTRODUCTION.

During his investigations into the feeding habits of shags on the Swan River, Dr. Serventy examined a large number of birds, most of which were passed on to the writer to examine for parasites. Three species of shags commonly occur on the Swan River:—

*Phalacrocorax varius* or the large pied shag.

*Phalacrocorax ater* or the small black shag.

*Microcarbo melanoleucus* or the small pied shag.

Number of each species of shag examined for parasites:—

<i>P. varius</i>	..	..	..	..	..	80 birds.
<i>P. ater</i>	..	..	..	..	..	30 birds.
<i>M. melanoleucus</i>	..	..	..	..	..	50 birds.

All of these birds harboured at least one species of parasite. Examinations were carried out monthly from January to July. It is rather noteworthy that the parasites were decidedly fewer in number in July than they had been previously. This seems to indicate a seasonal periodicity in the parasites. It was impossible at the time to carry on the investigations to see if this were the case.

One specimen of *Phalacrocorax carbo* from Mandurah was also examined and found to harbour several specimens of the small Cestode.

*Nematodes* are very numerous in the shags' stomachs.

In all, three Trematodes, two Cestodes and one Acanthocephalan were found in the shags.

### TABLE OF SPECIES OF PARASITES FOUND IN EACH SPECIES OF BIRD.

*P. varius*—*Dilepis minima* sp. nov., *Polymorphus clavatus* sp. nov., a young Trematode.

*P. ater*—*Paryphostomum phalacrocoracis* sp. nov., *Diplostomum granulorum* sp. nov., *Dilepis minima* sp. nov., *Polymorphus clavatus*.

*M. melanoleucus*—*Paryphostomum phalacrocoracis* sp. nov., *Dilepis minima* sp. nov., *Dilepis maxima* sp. nov., *Polymorphus clavatus* sp. nov.

In every case the fixative used was Kleinenberg's Picric Acid. Whole mounts were stained with Borax Carmine, and Lithium Carmine. Sections were cut to assist in the working out of the anatomy and were stained with Iron Haematoxylin and Mann's stain.

The species appear to be new as they differ markedly from the descriptions of other species available but it is impossible to be absolutely sure on this point owing to the deficiency of periodicals available for reference. However a study of the Zoological Record makes it appear that no references relevant to the species have been overlooked.

## CLASSIFICATION AND DESCRIPTION OF SPECIES.

### Class TREMATODA.

#### SUPERFAMILY ECHINOSTOMATOIDAE.

#### FAMILY ECHINOSTOMATIDAE.

Genus **PARYPHOSTOMUM** (Dietz).

**Paryphostomum phalacrocoracis** sp. nov.

Dietz 1910.

Edwards 1927.

Gogate 1934.

#### *Diagnosis of Species.*

*Size*—2.5 — 6.14 mm. long, the breadth equalling about 1/7th—1/8th of this.

*Collar Spines*—27 in number, in a single row. Ventrally the spines are gathered into two end groups of four spines each which are *broader and shorter* than the remaining nineteen.

*Ratio of diameter of oral to ventral sucker* = 1 : 4.5 — 6.

*Testes*.—anterior 4-6 lobed (0.47 mm. x 0.47 mm.), posterior 5-7 lobed (0.78 mm. x 0.4 mm.).

*Cirrus sac*—small (0.24 mm. x 0.06 mm.) and oblique.

The *vitellarium* extends to the base of the ventral sucker and fills the whole of the post-testicular space.

*Uterus*—moderately coiled.

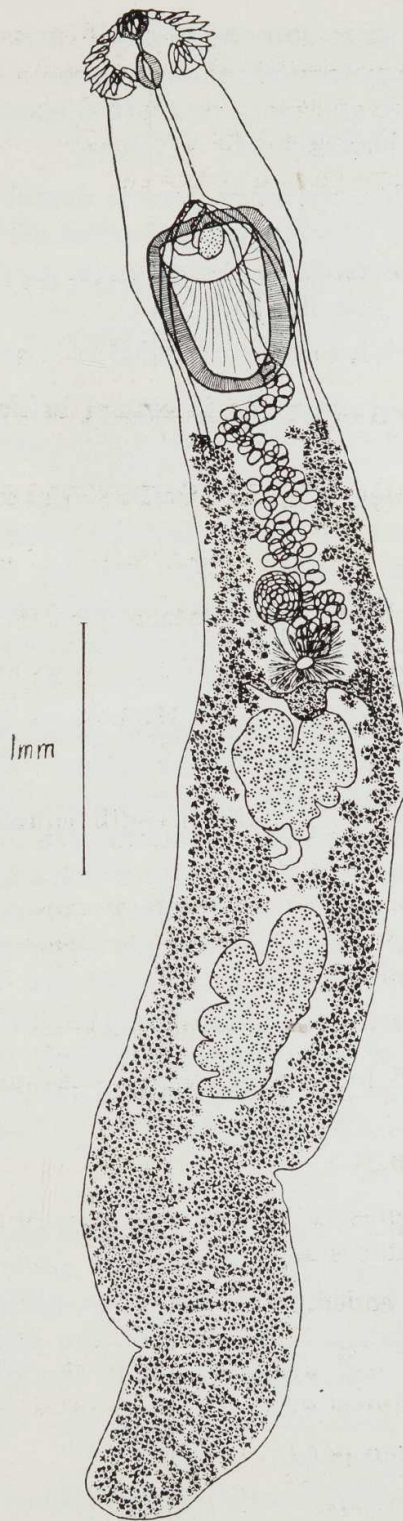
*Eggs*—100 or more 0.057 — 0.084 x 0.071 — 0.06 mm. in size.

*Host*. In the small intestine of *P. ater* and *M. melanoleucus*.

*No. present*—up to ten per bird.

#### *General Description of Species.*

Body elongated varying in length from 2.5 — 6.14 mms. (see fig. 1). Anteriorly in front of the ventral sucker the body is hollowed out ventrally and is thickly beset with small dermal spines which are plentiful ventrally but sparsely developed dorsally. The maximum width which occurs in the region of the testes is 0.8 mm. for a specimen 6.14 mms. long. Unless otherwise stated all measurements will refer to this specimen as it shows all the organs well and all measurements can therefore refer to one specimen only. The measurements were taken in balsam. The head collar (see fig. 2) is well developed and bears a single row of marginal spines, 27 in number and unbroken dorsally. Ventrally the collar spines are gathered into 2 "end groups" of 4 spines each.



Text Fig. 1.

The 8 spines forming the 2 "end groups" are shorter and wider than the remaining 19—their measurements being—

outermost spine from end group—0.1 mm. x 0.03 mm.  
and marginal spine—0.13 mm. x 0.023 mm.

*Alimentary Canal.*—The oral sucker which is sub-terminal is slightly broader than long (0.11 mm. x 0.09 mm.). It is connected with the oval muscular pharynx (0.11 mm. x 0.14 mm.) by the prepharynx (0.07 mm. long) passing on into the comparatively long oesophagus (0.44 mm.) which bifurcates to form the intestinal caecae immediately in front of the ventral sucker. The intestinal caecae terminate a little in front of the posterior end.

The ventral sucker is large and cup shaped—measuring 0.7 x 0.57 mm.—so that the ratio of the diameters of the oral to the ventral sucker is approximately 1:6. In the smaller and more contracted specimens the ratio between these 2 suckers may be as low as 1:4.5.

*Excretory System.*—The excretory pore is dorsal and near the posterior end. The excretory vesicle is elongated and gives off branches which ramify in the posterior body. It extends to the posterior testis where it divides into two and passes anteriorly (see fig. 3).

*Genital Organs.*

The genital pore lies between the intestinal bifurcation and the ventral sucker.

*Male.*—The testes lie one behind the other approximately in the middle of the space between the ventral sucker and the posterior end—the posterior one being larger than the anterior. The anterior testis is 4-6 lobed and measures 0.47 x 0.47 mm. while the posterior is 5-7 lobed and measures 0.78 x 0.4 mm. The cirrus pouch is moderately well developed, oblique to the main axis and measures 0.24 x 0.06 mm. (see figs. 1 & 4).

*Female.*—The almost spherical germarium (0.21 mm. x 0.19) lies to the right of the middle line anteriorly to the testes. The follicular vitellaria extend back from the ventral sucker in two lateral fields to the posterior testis, behind which they spread out to the middle line. The longitudinal vitelline ducts unite to form transverse ducts which expand medianly to form a vitelline reservoir (0.14 mm. x 0.15 mm.). From here a median duct passes to enter the oviduct which has already received the sperm from the receptaculum seminis. The oviduct passes into the ootype which is surrounded by a large median shell gland complex (0.29 mm. x 0.21 mm.). From here the slightly coiled uterus passes anteriorly to open just posteriorly to the cirrus sac. The eggs are numerous and measure 0.057 mm.—0.084 mm. x 0.071—0.06 mm.) (see figs. 1 & 5).

*Relationships.*

This species resembles *P. radiatum* (Dujardin) and *P. testitri-  
folium* (Gogate) in the possession of a single row of collar spines but it differs from *P. testitri-  
folium* in the shape of the testes which for *P. testitri-  
folium* are characteristically 3 lobed, in the sizes of the collar spines and in the relative sizes of the constituent parts especially the prepharynx and ventral sucker.

It differs from *P. radiatum* in

1. The ratio of the oral to the ventral sucker, which in *P. radiatum* is 1 : 3 is 1 : 4.5—6.
  2. The number of eggs (48 in *P. radiatum* and 100 in *P. phalacrocoracis*).
  3. The coilings of the uterus are more numerous.
  4. The cirrus sac is smaller.
- etc.

Table 1 shows the various characters of the several species of *Paryphostomum* and may serve to clarify the differences between them.

*P. indicum* is omitted from the table but it can be easily distinguished from the other species owing to the fact that it possesses 42 collar spines, whereas the other species possess only 27.

TABLE 1.  
 PARYPHOSTOMUM (Dietz).

	<i>P. radiatum</i> (Dietz).	<i>P. radiatum</i> (Edwards).	<i>P. segregatum</i> (Dietz).	<i>P. testrifolium</i> (Gogate).	<i>P. phalacrocor-</i> <i>acis</i> (sp.nov.).
No. of collar spines	double row 27	single row 27	double row 27	27	single or double row 27.
Size of animal	3.3-6.5mm. ....	2.3-6mm. ....	5.75mm. ....	3.5-5mm. ....	2.5-6.14mm.
Length of spines 19	0.074-0.102 x 0.0140-0.0204 mm.	0.0885-0.0922 x 0.0188mms.	0.1088-0.1224 x 0.0144-0.0168	0.064-0.101 x 0.03-0.0324	0.086-0.13 x 0.021-0.03mm.
Length of spines 4	0.1052-0.1224 x 0.030-0.034mm.	outermost of group 0.128 x 0.03mm. ; other 3, 0.1129 x 0.0188	0.1360-0.1428 x 0.0168-0.0216 (oral prs. can be longer)	0.108-0.115 x 0.044-0.0479	0.093-0.114 x 0.021-0.04mm. (outermost not larger than other three).
Ratio of length to breadth	6-7:1	4-5:1	....	about 6:1	about 7:1
Body spines ....	fore end of body covered	disappear at level of hinder margin of posterior testis. Dorsally as far as posterior border of sucker	....	....	thick anteriorly to ventral sucker—present or absent behind this. (only ventral not dorsal)
Distance between centres of suckers	1/5th of body length	1/5th of body length	....	....	1/5th-1/6th of body length.
Ratio of length of ventral sucker to length of body	....	1:10	1:9	1:10	1:9
Ratio of diameter of oral to ventral suckers	1:3.5-4	1:3	approx. 1:3	1:4-5	1:4.5-6
Prepharynx ....	0.09-0.18mm.	....	0.034-0.075mm.	0.027mm.	0.07mm. specimen 6.14mm. long.
Pharynx ....	0.15-0.16 x 0.12-0.13mm.	0.16 x 0.145 mm.	0.156 (spherical) or oval 0.14-0.17 x 0.11-0.15mm.	0.135 x 0.093 mm.	0.11 x 0.14mm.
Oesophagus ....	....	0.32mm.	....	0.464mm.	0.44mm.
Oral sucker ....	0.10-0.16mm. in diameter	....	0.17-0.18mm. in diameter	....	0.11 x 0.09mm. in diameter.
Anterior Testis	3-7 lobed	4-5 lobed (0.5 x 0.48mm.)	5-7 lobed	3 lobed	4-6 lobed (0.47 x 0.47mm.)
Posterior Testis	3-7 lobed	5-6 lobed (0.55 x 0.55mm.) 2/3rds of body length from anterior end	5-7 lobed	3 lobed	5-7 lobed (0.78 x 0.4mm.) 2/3rds of body length from anterior end.
Post-testicular space	....	1.35mm. ....	....	....	1.7mm.
Gerarium ....	0.11-0.17mm.	0.21mm.	0.17-0.20mm. in diameter	0.17 x 0.165 mm.	0.21 x 0.19mm.
Cirrus Pouch....	Small, almost entirely in front of ventral sucker	0.7 x 0.3 extends back posteriorly to the level of the centre of the ventral sucker	....	0.197 x 0.0945	0.25 x 0.06 extending back to 1/5th of length of ventral sucker.
Uterus ....	....	few coils ....	....	short, not very coiled	more coiled.

TABLE 1—*continued*.

—	<i>P. radiatum</i> (Dietz).	<i>P. radiatum</i> (Edwards).	<i>P. segregatum</i> (Dietz).	<i>P. tetrifolium</i> (Gogate).	<i>P. phalacrocor-</i> <i>acis</i> (sp.nov.).
Eggs ....	....	maximum 48. size 0.08–0.1 x 0.05–0.064 mm.	few, 0.0864– 0.0884 x 0.057– 0.060mm.	small and num- erous 0.0771 x 0.0407	100 or more. size 0.057–0.084 x 0.071–0.06mm.
Shell gland ....	....	0.22 x 0.194 mm.	....	0.19 x 0.275 mm.	0.29 x 0.21mm.
Ventral sucker on border of	1st and 2nd $\frac{1}{4}$ 's of body length	1st and 2nd $\frac{1}{3}$ 's of body length	....	....	1st and 2nd $\frac{1}{5}$ th of body length.

Family **STRIGEIDAE**.Subfamily **POLYCOTYLINAE**.Genus **DIPLOSTOMUM** (Dubois), 1932.(syn. *Hemis'omum* (Brandes)), 1891.**Diplostomum granulosum** sp. nov.*Diagnosis of Species.*

*Size*.—1.23 mm. x 0.61 mm. at widest point, which is anterior. Anterior region is flattened 0.6 x 0.61 mm. The posterior region is cylindrical 0.63 x 0.38 mm.

*Ventral sucker*.—Slightly smaller than the oral sucker (diam. 0.08 mm.).

*Hold fast organ*.—Large and bilobed, glandular tissue well developed.

*Genitalia.*

*Male*.—Anterior testis assymmetrical—developed on left side—0.21 x 0.16 mm.

*Female*.—Germarium median.

*Vitellarium* extends to beyond the ventral sucker in the anterior body. Receptaculum seminis, shell gland and ootype to the right of anterior testis.

*Eggs*.—Few and large 0.086 x 0.085 mm.

*Host*.—In the small intestine of *P. ater*—very numerous.

*General Description.*

This is a small form 1.23 mm. long x 0.61 mm. at its widest point. The general shape is rather triangular, the base of the triangle being anterior, but actually the worm is distinctly divided into two regions, the anterior being flattened and concave ventrally (0.6 mm. x 0.61 mm.) and the posterior cylindrical (0.63 x 0.38 mm.).

Anteriorly the worm has a rather 3 lobed appearance due to the development of lateral pseudosuckers flanking the median oral sucker (0.086 mm. in diameter). The pseudosuckers are depressions marking the openings of the ducts of cephalic glands. The elongated and muscular pharynx (0.043 mm. x 0.055 mm.) passes into a short oesophagus (0.043 mm. long) which bifurcates to form the intestinal caecae passing to the posterior end of the body (see fig. 6).

The ventral sucker is slightly smaller than the oral sucker (0.08 mm. in diameter) and is covered over by the hold fast organ. The hold fast organ is large and bilobed and the glandular tissue at its base is very well developed (see fig. 6, 7, 8, and 9).

#### *Genital organs.*

*Male.*—Testes one behind the other. The anterior testis (0.21 mm. x 0.16) is assymmetrical and developed in the left half of the body in the first third of the posterior body. The posterior testis is larger (0.34 x 0.17 mm.) and extends right across the body occupying the second third. It tends to be slightly bilobed. The last third of the posterior body is occupied by the vesicula seminalis which opens to the exterior dorsally about 0.03 mm. from the posterior end (see fig. 6 and 9).

*Female.*—Ovary (0.16 x 0.1 mm.), oval, median in front of the anterior testis. Vitelline follicles—in both anterior and posterior body. Posteriorly they are practically confined to the lateral and ventral region of the post-testicular region but anteriorly they are better developed. They extend to beyond the intestinal bifurcation and spread out dorsally over the body and extend down to the ovarian region. The vitelline reservoir is well developed and occurs between the two testes. The receptaculum seminis, shell gland and ootype lie to the right of the anterior testis. The uterus passes from the ootype anteriorly to beyond the ovary and then turns posteriorly opening into the genital atrium. The eggs are few and large 0.086 x 0.085 mm. (see fig. 6).

This species differs from all the other members of the genus chiefly in the extent of the hold fast organ which completely covers over the ventral sucker and in the body shape which is characteristically widest right anteriorly. It also differs from the majority of species in that it is broadest anteriorly, the oral sucker is larger than the ventral sucker, the germarium is median and the anterior testis is only developed on the left side.

#### Family **STERINGOPHORIDAE.**

This is an immature Trematode which probably belongs to the *Steringophoridae*. Only the rudiments of the reproductory organs including the cirrus sac are developed, so that it is impossible to ascertain whether these correspond completely with those of fam. *Steringophoridae* or not. It agrees in all other points with the diagnosis of this family as given by Fuhrmann (1932).

*Host.*—*P. varius* at the end of the small intestine. Only about half dozen specimens found.

#### *Description.*

The worm is 2.3 mm. long x 0.71 mm. at its greatest width (see fig. 10). It is roughly oval in surface view but rather wider anteriorly than posteriorly. The oral sucker is large and circular, being 0.37 mm. in diameter, whilst the ventral sucker is smaller and rather elongated, measuring 0.27 mm. x 0.11 mm. The distance between the centres of the suckers being 0.67 mm.

*Alimentary Canal.*—A prepharynx is not developed but the pharynx is large, measuring 0.36 mm. long x 0.16 mm. wide. Oesophagus is almost absent. The intestinal branches are very long and convoluted. From the oesophagus on either side they extend anteriorly and then posteriorly to the hinder end.

*Excretory System.*—The excretory bladder is Y shaped—the stem region extending to immediately below the ventral sucker where it divides into two.

*Genitalia.*

*Male.*—The testes occur in the posterior body, the left testis being slightly anterior to the right. The cirrus sac is developed dorsally to the ventral sucker and measures 0.11 mm. x 0.13 mm. The genital pore is slightly displaced to the left of the ventral sucker.

*Female.*—Germarium is developed anteriorly to the testes and to the right side. To the inner side of this, there is some darkly staining tissue which probably represents the shell gland and there is a strand of darkly staining tissue which passes from this region to the genital pore which probably represents the uterus.

*Remarks.*

The Fam. *Steringophoridae* have so far only been found in fish and it is probable that these parasites were present in one of the fish eaten by the shags and were not actually parasitising the shags. The fact that they were only found on one occasion although especially searched for on subsequent occasions seems to support this view. Also the parasites were at the extreme end of the small intestine and were immature.

Class CESTODA.

Order CYCLOPHYLLIDEA.

Super-Family DILEPIDOIDAE.

Family DILEPIDIDAE.

Sub-Family DILEPIDINAE.

Genus DILEPIS (Weinland).

Weinland 1858 fide Burt 1936.

Fuhrmann 1932 fide Bart 1933.

Burt 1936.

There are two species of this genus found in local shags which differ considerably from one another and from all other species of the genus *Dilepis*. These two species are described individually and then a comparison is drawn between each of them and the related species.

*Dilepis maxima* sp. nov.

*Diagnosis of species.*

*Size.*—13 cms. long x 1.21 mms. broad—864 segments.

*Scolex.*—350  $\mu$  broad with 4 suckers 114  $\mu$  in diameter.

*Rostellum.*—Is armed with a double crown of 20 hooks the larger being 153  $\mu$  the smaller 108  $\mu$ .

*Genital aperture.*—About 1-3rd of the distance down the left side.

*Male genitalia*—*cirrus* 0.1 mm. long armed at the base with two small spines 0.03 mm. long—*cirrus sac* 0.3 mm. long, *testes* normally 4 situated behind and laterally to the germarium in the medulla.

*Female.*—Vaginal pore ventral to cirrus—germarium and vitellarium median—ova 0.035 x 0.021 mm.

*Genital ducts.*—Dorsal to excretory canals.



*Excretory canals.*—The dorsal canals are narrower than the ventral canals, which are connected posteriorly by transverse commissures.

*Host*—*M. melanoleucus*—in the intestine.—A few.

#### *General Description.*

Several specimens of this worm were obtained from *M. melanoleucus* but not in any other species of shag. The worms measure about 130 mms. in length and have a maximum breadth of 1.21 mms. The scolex which is nearly square in surface view (see fig. 12) has a width of 0.43 mm. and a dorso ventral diameter of 0.35 mm. It bears 4 circular suckers 0.114 mm. in diameter. The rostellum is armed with a double crown of 20 hooks the anterior row being 108 $\mu$  long and the posterior 153 $\mu$ . (see fig. 13). The scolex as a whole is well marked off from the remainder of the strobila and is broader anteriorly (see fig. 11).—No specimen had the rostellum everted.

The neck region is fairly short (0.43 mm.) and passes without change of width (0.20 mm.) into the region showing strobilation which very gradually increases in width to the end of the strobila. The anterior segments measure 0.21 mm. x 0.07 mm. and these gradually increase in both directions especially in length until the sexually mature segments measure 0.56 mm. x 0.33 mm. The gravid proglottids measure 1.21 mm. x 0.57 mm. From the above it is evident that throughout the whole strobila the segments are rectangular and broader than long.

The genital apertures are unilateral, situated at about 1-3rd of the length of the proglottid from the anterior end.

*Excretory canals.*—There are two pairs of excretory canals—dorsal and ventral—both of which pass ventrally to the cirrus sac.

#### *Genital Organs.*

*Male.*—Normally 4 testes (0.07 mm. in diameter) lying behind and to the sides of the Female complex (see figs. 15-19).

In several segments 5 or 6 testes were found but none contained less than 4. The cirrus is armed with a pair of small spines at its base (0.03 mm. long) (see fig. 14).

The vas deferens which opens into the cirrus pouch is very coiled and is situated in the anterior end of the proglottid and extends beyond the middle line. The cirrus sac itself is very long (0.3 mm.) and contains the vesicula seminalis. The actual disposition of the organs can be seen in the figures (15-19). (The cirrus itself is 0.1 mm. long.)

*Female.*—The vagina opens into the genital atrium just ventral to the cirrus. The female genital complex is median, the bilobed germarium (each wing 0.03 mm. in diam.) lying anterior to the slightly lobed vitellarium (0.035 mm. in diam.) (see fig. 16). The receptaculum seminis is large and median—between the two lobes of the germarium. A duct from this enters the oviduct which then passes on to receive the vitelline duct and enter the shell gland which is small and inconspicuous. The uterus arising from this becomes bilobed and gradually expands laterally and downwards until it finally fills the whole segment. When first formed it is just a single lobe on either side. However it gradually becomes more and more lobed—the two halves uniting anteriorly. Finally the uterus breaks up into a number of egg capsules (see figs. 14-22).

(See note at end of description of *D. minima* (page 11).)

**Dilepis minima** sp. nov.

This is a very small form measuring 5.5 mm. and consisting of about 90 segments. I have not so far been able to work out the detailed anatomy of this worm, but the following description should serve for the identification of the species.

*Diagnosis of Species.*

*Size.*—About 5.5 mms. long x 0.2 mms. broad, about 90 segments.

*Scolex.*—0.31 mm. x 0.28 mm. bearing 4 suckers each 0.13 in diam.—rostellum 0.14 mm. in diam., armed with a double crown of 20 hooks—larger hooks 110  $\mu$ —smaller 100  $\mu$ .

*Genital pores.*—Unilateral, about middle of left side of proglottid.

*Male Genitalia.*—Cirrus 0.24 mm. long—armed with backwardly directed spines 5  $\mu$  long. Testes 3 in number one to each side of, and one posterior and dorsal to female complex.

*Female Genitalia.*—Median in position. Vagina posterior to cirrus.

*Ova.*—14 $\mu$  in diameter.

*Host.*—*P. varius*, *M. melanoleucus* & *P. ater*: Numerous.

*General Description.*

The worm measures up to 5.5 mm. in length and has a maximum width of 0.2 mm. There are 60-90 segments (see fig. 23). The scolex is large and sharply marked off from the remainder of the strobila which is segmented immediately behind the scolex, i.e., there is no neck. When the rostellum is everted the scolex measures 0.31 mm. in length x 0.28 diam. (See fig. 24.) It bears 4 circular unarmed suckers 0.13 mm. in diam. The globular rostellum 0.14 mm. in diam. bears 2 crowns of hooks about 20 in number approximately equal in size and alternating—upper row 0.11 mm. long—lower 0.10 mm. long (see fig. 25). The length of the attachment in both is 0.03 mm. The hooks are approximately 0.009 mm. wide at the base and they taper to a point.

The first formed segments measure 0.186 mm. wide x 0.01 mm. long, and as the segments become sexually mature they increase in length but not in width (0.186 mm. x 0.026 mm.) until the uterus begins to be formed when it reaches (0.2 x 0.043).

This relatively much greater increase in length than width becomes much more marked in the gravid segments (0.2 mm. x 0.2 mm). These segments separate off from one another to a certain extent so that they resemble a string of beads. The genital pores are unilateral and are situated in about the middle of the segments. The cirrus is very elongated (0.24 mm.) and beset with numerous small spines projecting posteriorly (0.005 mm. long) (see fig. 32).

*Excretory canals.*—There appears to be only one pair of longitudinal excretory vessels.

*Male genital organs.*—There are three testes (0.026 mm. x 0.014 mm.) lying one on each side of the Female complex and one median and posterior to this (see figs. 26 and 27). They gradually disappear as the uterus begins to develop (about segment 26). The vas deferens is coiled and opens into the cirrus pouch which extends to beyond the middle of the proglottid. The cirrus pouch contains the armed cirrus which when everted is as long or longer than the breadth of the proglottid.

*Female genitalia.*—The Female genitalia are median in position (see fig. 27). The germarium is bilobed (each lobe being about 0.007 mm. in

diam.), and the vitellarium (0.01 mm. in diam.) is situated between the two lobes and posteriorly to them. The uterus is developed as a bilobed structure which gradually increases in size, finally the halves uniting and filling the whole segment (see figs. 28-31). All the genital organs with the exception of the uterus and cirrus have disappeared in segment 39 and from this segment on to the end the uterus gradually matures. The eggs are about 0.014 mm. in diameter.

*Note.*—These two species (*D. maxima* and *D. minima*) show a superficial resemblance to worms of the Family *Hymenolepidae*, but they are definitely distinct from this group in an important feature—namely, they possess two rows of hooks on the rostellum instead of one which is characteristic of the *Hymenolepidae*. The possession of three or four testes seems to indicate a relationship with this family, but other species of *Dilepis* have been described which possess only three or four testes.

According to Burt only three species of *Dilepis* are known from *Pelecaniformes* and he describes a further species making the number up to four. A table will clarify the difference between the two new species and these four.

## DILEPIS (WEINLAND).

—	<i>D. kempfi</i> (Southwell).	<i>D. scoleceina</i> (Rudolphi).	<i>D. dela-</i> <i>chauxi</i> (Fuhr- <i>mann).</i>	<i>D. lepidocol-</i> <i>pos</i> (Burt).	<i>D. maxima</i> (sp.nov.).	<i>D. minima</i> (sp.nov.).
Length ....	5cms. x 1mm.	....	....	20cms x 1.8mm.	13cms. x 1.21mm.	5.5mm. x 0.2mm.
No. of proglottides	500	....	....	450	864	up to 90
Scolex ....	220 $\mu$ x 400 $\mu$	500 $\mu$	....	700 $\mu$ broad	350 $\mu$	310 $\mu$
Suckers ....	100 $\mu$	170 $\mu$	....	260 $\mu$	114 $\mu$	130 $\mu$
Rostellum ....	170 $\mu$	200 $\mu$	....	330 $\mu$	....	140 $\mu$
Hooks—Anterior	175 $\mu$	93 $\mu$ –103 $\mu$	465 $\mu$	105 $\mu$	153 $\mu$	110 $\mu$
Posterior	135 $\mu$	63 $\mu$ –64 $\mu$	282 $\mu$	84 $\mu$	108 $\mu$	100 $\mu$
Genital pores ....	....	....	....	left side	left side	left side
Male genital organs (Cirrus)	small and insignificant	190 $\mu$ x 80 $\mu$	....	153 $\mu$ x 34 $\mu$ armed with spines 8.5 $\mu$ long	armed with 2 small spines at base. (0.03mm. long)	240 $\mu$ armed with spines 5 $\mu$ long
Testes ....	3	numerous	....	4 in transverse row	4 (behind and to side of Female complex)	3 in transverse row
Female pore ....	in front of cirrus	posterior to cirrus	....	antero-ventral to cirrus armed with spines	ventral to cirrus	ventral to cirrus
Germarium ....	median	....	poral	poral	median	median
Genital ducts ....	....	....	....	dorsal to excretory canals	dorsal to excretory canals	....
Excretory canals	....	....	....	narrow dorsally and wide ventrally	narrow dorsally and wide ventrally	....
Ova ....	....	....	....	10.5 $\mu$	35 $\mu$ x 21 $\mu$	14 $\mu$
Fixation ....	....	scolex in a sac	....	scolex in a sac	scolex not in a sac	scolex not in a sac

## Class ACANTHOCEPHALA.

## Order PALAEACANTHOCEPHALA.

## Family POLYMORPHIDAE.

## Sub-Family POLYMORPHINAE.

## Genus CORYNOSOMA (Lühe), 1911.

*Corynosoma clavatus* sp. nov.

This species corresponds to the definition of the genus *Corynosoma* as given by Meyer (1932), but differs from all the other known species of this genus in that the neck region is very long and when extruded (fig. 33) closely resembles the genus *Polymorphus*. It differs from this genus however in the shape of the cement glands, which are pear-shaped and not tubular.

*Specific diagnosis.*

Female 3.32 mms. long (neck everted).

Female 2.07 mms. long (neck retracted).

Male 1.4 mms. long (neck retracted).

(No specimen found with anterior body everted.)

Proboscis armed with 14 longitudinal rows of 10-11 hooks.

Neck partly armed. When the neck is everted in the female the position of the demarcation between the neck and the posterior body is 1.25 mms. from the anterior end. Testes (0.29 mm. x 19 mm.).

*Cement glands* 0.14 mm. x 0.13 mm.

*Eggs* 0.029 mm. x 0.17 mm.

*Host.*—*P. varius*, *M. melanoleucus*, *P. ater*.—Numerous.

*General Description.*

When the neck is everted the female is 3.32 mms. in length and the greatest depth is 0.7 mm. (see fig. 33). In this condition the form closely resembles *Polymorphus*. However when the neck is retracted, it is disc-shaped and measures 1.3 mm. in diameter (see fig. 34). The male is appreciably smaller than the female, being 1.4 mm. (neck retracted) x 0.6 mm. in the greatest depth. (Judging from the relative size of the female neck, the male would have a total length of about 2.5 mm.)

The neck and proboscis measures 1.25 mms. in length in the female. In both male and female the proboscis is 0.63 mm. long, and is armed with 14 longitudinal rows of 10-11 hooks which are largest in the middle and very small posteriorly (see fig. 35).

## Relative sizes of the hooks:—

anterior (5-6)—0.04 x 0.014 mm.

middle (6-7)—0.074 x 0.029 mm.

posterior (7-11)—0.036 x 0.007 mm.

The proboscis is club-shaped, being:—

0.14 mm. in diam. anterior.

0.2 mm. in diam. middle.

0.16 mm. in diam. posterior.

The base of the neck (0.5 mm.) is armed with a few small spines 0.02 mm. long and these spines become larger (0.03 mm.) and more numerous around the constriction which is very distinct. From here they extend ventrally for a short distance.

The proboscis sheath is 0.86 mm. long x 0.19 mm. wide and the lemnisci are small and band-like.

#### *Genitalia.*

*Male.*—The testes are large and oval (0.29 mm. x 0.19 mm.), the right being slightly further anterior than the left. In the contracted condition of the neck the testes lie in the disc-like structure to either side of the proboscis. The cement glands are 6 in number and pear-shaped, measuring 0.14 mm. x 0.13 mm. The cement ducts are wide and unite to form a reservoir. The ejaculatory duct opens into the bursa whose walls are folded in the introverted condition (see figs. 36-38).

*Female.*—The eggs which are 0.03 mm. long x 0.014 mm. wide fill all the body space in the female. The genital pore is terminal and the vagina is very muscular.

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## KEY TO LETTERING OF TEXT FIGURES.

a.g.—adhesive gland.	o.—ootype.
a.t.—anterior testis.	oes.—oesophagus.
b.—bursa.	o.d.—oviduct.
c.—cirrus.	o.s.—oral sucker.
c.d.—cement duct.	ph.—pharynx.
c.g.—cement gland.	p.—proboscis.
c.r.—cement reservoir.	p.r.—proboscis receptacle.
c.s.—cirrus sac.	p.s.—pseudosucker.
cut.—cuticle.	p.t.—posterior testis.
d.—disc.	r.—rostellum.
e.—egg.	r.s.—receptaculum seminis.
e.c.d.—dorsal excretory canal.	s.—sucker.
e.c.v.—ventral excretory canal.	s.g.—shell gland.
e.c.—excretory canal.	sp.—spine.
e.v.—excretory vesicle.	t.—testis.
g.—germarium.	u.—uterus.
g.a.—genital atrium.	v.—vagina.
g.p.—genital pore.	v.d.—vas deferens.
h.f.—hold fast organ.	ves. sem.—vesicula seminalis.
i.—intestine.	vit.—vitellarium.
l.—lemnisci.	vit. r.—vitelline reservoir.
n.—nerve cord.	v.s.—ventral sucker.